APPLICATION

The various protective functions of the MRDT4 are specifically tailored to the protection of two winding transformers. The device offers in addition to the differential protection various communication and backup protection functions. Furthermore the MRDT4 can be used for generator differential protection.

ALL INCLUSIVE:
- All protection features without extra charge
- Parameter setting and evaluation software
- Disturbance record analysis software

TRANSFORMER PHASE DIFFERENTIAL PROTECTION
- Stabilized phase differential protection with transients and C.T. saturation detection
- Various selectable transformer groups
- Zero sequence removal
- Three point slope characteristic
- High set element (non-restraint)

TWO ELEMENTS GROUND DIFFERENTIAL PROTECTION
- Three point slope characteristic
- High set element (non-restraint)

BACKUP PROTECTION
- 4 Elements Overcurrent/short-circuit protection (non-directional)
- 4 Elements Earth fault protection (non-directional)
- Tripping characteristics:
  - DEFT
  - ANSI: NINV, VINV, EINV
  - IEC: NINV, VINV, LINV, EINV, RXIDG
  - Thermal Flat, IT, I2T, I4T

TWO ELEMENTS UNBALANCED LOAD PROTECTION
- Supervision by definite time or tripping characteristic

RECORDERS
- Disturbance recorder: 120 s non volatile
- Fault recorder: 20 faults
- Event recorder: 300 events
- Trend recorder: 4000 non volatile entries

ADDITIONAL HIGHLIGHTS
- Inrush
- Thermal replica
- Four elements external protection
- Plausibility checks
- Adaptive parameter sets
- Status display
- Breaker Manager, Breaker wear

COMPREHENSIVE MEASURED VALUES AND STATISTICS
- THD (total harmonic distortion)
- Current phasors and angles
- RMS and fundamental
- Sequence currents
- Differential currents

TEMPERATURE PROTECTION
- Buchholz (sudden pressure), ext.
- oil temperature, and aux. temperature protection via digital input
- Temperature measurement via external RTD-box (option)

SUPERVISION
- Current transformer supervision
- Circuit breaker failure protection
- Trip circuit supervision
- Cold load pickup
- Switch onto fault

COMMISSIONING SUPPORT
- USB connection
- Customizable Display (Single-Line, ...)
- Customizable Inserts
- Copy and compare parameter sets
- Forcing and disarming of output relays
- Fault simulator
- Graphical display of tripping characteristics
- 8 languages selectable within the relay

COMMUNICATION OPTIONS
- IEC 61850, IEC 60870-5-103, Profbus DP
- Modbus RTU and/or Modbus TCP
- DNP 3.0 (RTU, TCP, UDP)

IT SECURITY
- Menu for the activation of BDEW-Whitewaper-compliant security settings (e.g. hardening of interfaces)

CONTROL
- Two breakers (or isolators/grounding switches)
- Breaker wear

LOGIC
- Up to 80 logic equations for protection, control and monitoring

TIME SYNCHRONISATION
- SNTP, IRIG-800X, Modbus, DNP 3.0, IEC60870-5-103

PC TOOLS
- Setting and analyzing software
  - Smart view for free
  - Including page editor to design own pages
## FUNCTIONAL OVERVIEW

### Protective Functions

<table>
<thead>
<tr>
<th>Description</th>
<th>Elements</th>
<th>ANSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transformer differential protection (2 windings), Id:</td>
<td>1</td>
<td>87T</td>
</tr>
<tr>
<td>Curve with zero point and three settable slopes and highest element (Id&gt;&gt;),</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inrush stabilisation / detection of 2nd, 4th and 5th harmonics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Restricted earth fault IdG, IdG&gt;&gt;, characteristics similar to 87T</td>
<td>2</td>
<td>87TN</td>
</tr>
<tr>
<td>i, time overcurrent and short circuit protection (non-directional)</td>
<td>4</td>
<td>50P</td>
</tr>
<tr>
<td>Multiple reset options (instantaneous, definite time, reset characteristics according to IEC and ANSI)</td>
<td></td>
<td>51P</td>
</tr>
<tr>
<td>2&gt;, unbalanced load protection with evaluation of the negative phase sequence currents</td>
<td>2</td>
<td>46</td>
</tr>
<tr>
<td>THi, overload protection with thermal replica for transformers IEC60255-8, alarm and trip threshold</td>
<td>1</td>
<td>49T</td>
</tr>
<tr>
<td>IH2/In, inrush detection with evaluation of the 2nd harmonic</td>
<td>2</td>
<td>Inrush</td>
</tr>
<tr>
<td>IG, earth overcurrent and short circuit protection (non-directional)</td>
<td>4</td>
<td>50N</td>
</tr>
<tr>
<td>Tremendous reset options (instantaneous, definite time, reset characteristics according to IEC and ANSI)</td>
<td></td>
<td>51N</td>
</tr>
<tr>
<td>ExP, External alarm and trip functions</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>RTD temperature supervision via optional RTD-Box with 12 sensors</td>
<td></td>
<td>26</td>
</tr>
</tbody>
</table>

### Control and Logic

- **Control:** Position indication, supervision time management and interlockings for 2 breakers
- **Logic:** Up to 80 logic equations, each with 4 inputs, selectable logical gates, timers and memory function

### Supervision Functions

<table>
<thead>
<tr>
<th>Description</th>
<th>Elements</th>
<th>ANSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBF, circuit breaker failure protection for both circuit breakers</td>
<td>2</td>
<td>50BF</td>
</tr>
<tr>
<td>TCS, trip circuit supervision</td>
<td>2</td>
<td>50TC</td>
</tr>
<tr>
<td>CTs, current transformer supervision</td>
<td>2</td>
<td>60L</td>
</tr>
<tr>
<td>CLPU, cold load pickup</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>SOTF, switch onto fault</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>BW, breaker wear</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Non volatile event recorder up to 120 s with 32 samples per cycles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THD supervision</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## APPROVALS

- Certified regarding UL508 (Industrial Controls)
- Certified regarding CSA-C22.2 No. 14 (Industrial Controls)
- Certified by EAC (Eurasian Conformity)
- Type tested (and certified) regarding IEC60255-1
- Lloyd’s Register Type Approval Certificate

## CONNECTIONS (EXAMPLE)

- Complies with IEEE 1547-2003 amended by IEEE 1547a-2014
- Complies with ANSI C37.90-2005

---

MRDT4-2 | TRANSFORMER DIFFERENTIAL PROTECTION RELAY

---

www.woodward.com
MRDT4

Typical Configuration

Winding Side 1

Winding Side 2

W1
74TC

W1
Inrush

W1
50

W1
51

W1
46

W1
50BF

W1
87N

W2
50N

W2
50N

W2
51N

W2
51N

W2
87N

W2
Inrush

W2
50

W2
51

W2
46

W2
50BF

W2
87N

Switchgear Wear (2 elements)

3
3

49

W1 or W2
CLPU

W1 or W2
SOTF

87T

Programmable Logic

Control

Comm Interface(s)

SNTP

IRIG

Current Max/Min/Avg,
THD Current,
Current Phasors,
Sequence Currents,
Diff Currents,
Harmonic Currents

Fault recorder

Event recorder

Disturbance recorder

Trend recorder

FUNCTIONAL OVERVIEW IN ANSI FORM

Released
## ORDER FORM MRDT4-2

<table>
<thead>
<tr>
<th>Non-directional Transformer Differential Protection</th>
<th>MRDT4-2</th>
</tr>
</thead>
</table>

**Version 2 with USB, enhanced communication and user options**

<table>
<thead>
<tr>
<th>Digital Inputs</th>
<th>Binary output relays</th>
<th>Housing</th>
<th>Large display</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>7</td>
<td>B2</td>
<td>A</td>
</tr>
<tr>
<td>16</td>
<td>13</td>
<td>B2</td>
<td>D</td>
</tr>
</tbody>
</table>

**Hardware variants**

- Phase Current 5 A/1 A, W1/W2 Ground Current 5 A/1 A
  - 0
- Phase Current 5 A/1 A, W1 Sen. Gr. Curr. 5 A/1 A, W2 Gr. Curr. 5 A/1 A
  - 1
- Phase Current 5 A/1 A, W1 Gr. Curr. 5 A/1 A, W2 Sen. Gr. Curr. 5 A/1 A
  - 2
- Phase Current 5 A/1 A, W1/W2 Sen. Gr. Curr. 5 A/1 A
  - 3

**Housing and mounting**

- Door mounting
  - A
- Door mounting 19” (flush mounting)
  - B

**Communication protocol**

- Without protocol
  - A
- Modbus RTU, IEC60870-5-103, DNP3.0 RTU | RS485/terminals
  - B
- Modbus TCP, DNP3.0 TCP/UDP | Ethernet 100 MB/RU45
  - C
- Profibus-DP | optic fiber/ST-connector
  - D
- Profibus-DP | RS485/D-SUB
  - E
- Modbus RTU, IEC60870-5-103, DNP3.0 RTU | optic fiber/ST-connector
  - F
- Modbus RTU, IEC60870-5-103, DNP3.0 RTU | RS485/D-SUB
  - G
- IEC61850, Modbus TCP, DNP3.0 TCP/UDP | Ethernet 100 MB/RU45
  - H
- IEC60870-5-103, Modbus RTU, DNP3.0 RTU | RS485/terminals
  - I
- Modbus TCP, DNP3.0 TCP/UDP | Ethernet 100 MB/RU45
  - J
- IEC61850, Modbus TCP, DNP3.0 TCP/UDP | Optical Ethernet 100 MB/1C duplex connector
  - K
- Modbus TCP, DNP3.0 TCP/UDP | Optical Ethernet 100 MB/1C duplex connector
  - L
- IEC60870-5-103, Modbus RTU, DNP3.0 RTU | RS485/terminals
  - M
- IEC61850, Modbus TCP, DNP3.0 TCP/UDP | Ethernet 100 MB/RU45
  - N
- IEC60870-5-103, Modbus RTU, DNP3.0 RTU | RS485/terminals
  - O
- IEC61850, Modbus TCP, DNP3.0 TCP/UDP | Optical Ethernet 100 MB/1C duplex connector
  - P
- Modbus TCP, DNP3.0 TCP/UDP | Optical Ethernet 100 MB/1C duplex connector
  - Q
- IEC60870-5-103, Modbus RTU, DNP3.0 RTU | RS485/terminals
  - R
- IEC61850, Modbus TCP, DNP3.0 TCP/UDP | Ethernet 100 MB/RU45
  - S

**Harsh Environment Option**

- None
  - A
- Conformal Coating
  - B

**Available menu languages (in every device)**

- English
- German
- Spanish
- Russian
- Polish
- Portuguese
- French
- Romanian

*Within every communication option only one communication protocol is usable.

Smart view can be used in parallel via the Ethernet interface (RU45).

The parameterizing- and disturbance analyzing software Smart view is included in the delivery of HighPROTEC devices.

---

**Current inputs**

- 8 (1 A and 5 A) with automatic CT Disconnect

**Digital inputs**

- Switching thresholds adjustable via software

**Power supply**

- Wide range power supply
  - 24 Vdc – 270 Vdc / 48 Vdc – 230 Vdc (~20/+10%)
  - All terminals plug type

**Terminals**

- IP54

**Dimensions of housing**

- (W × H × D)
  - 19” flush mounting: 212.7 mm × 173 mm × 208 mm
  - 8.374 in. × 6.811 in. × 8.189 in.
  - Door mounting: 212.7 mm × 183 mm × 208 mm
  - 8.374 in. × 7.205 in. × 8.189 in.

**Weight (max. components)**

- approx. 4 kg

---

© Woodward
All Rights Reserved | 02/2018